

CERTIFICATE

I, Thomas Kitzhofer, of Manzingerweg 7, 81241 München, Germany, declare that I am conversant with the German and English languages, and that to the best of my knowledge and belief the accompanying text is a true translation of the priority document issued by the German Patent and Trademark Office on 24 July 2003, for Serial No. 102 57 398.0.

Signed this 28th day of September 2004



Certified Translation

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**Certificate of Priority Relating to the Filing
of a Patent Application**

Serial Number: 102 57 398.0

Filing Date: 09 December 2002

Applicant/Owner: ArvinMeritor GmbH, Dietzenbach/Germany

Title: Vehicle Roof

IPC: B 62 D 25/06

**The attached documents are a correct and true copy of the original documents of
this patent application.**

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Munich, dated 24 July 2003
German Patent and Trademark Office
The President
By:

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Ebert

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9 December 2002

Vehicle Roof

The present invention relates to a vehicle roof, having a roof frame and a roof module, which is permanently and fixedly attached to the roof frame, the roof frame having an edge that points inwardly toward the roof module.

- 5 Modern vehicle roofs are not made up of a sheet metal roof that is welded to the roof frame or configured as an integral part thereof, but rather they are increasingly made of a roof frame, to which a roof module, which is manufactured by a supplier, is permanently and fixedly attached by means of gluing and by screws. To say that it is permanently and fixedly attached is not to exclude the
- 10 possibility that the roof module, for purposes of replacement, can be separated from the frame in the workshop, in order to be replaced by a new roof module, which again is permanently and fixedly attached to the roof frame. In this context, the roof module is customarily made of plastic, having an exterior skin made of, for example, an aluminum or plastic film, which is provided with a foam backing.
- 15 The roof module must remain attached to the roof frame even in the event of an impact and a heavy deformation of the roof frame. In case of a lateral impact, which is simulated by a pole impact test, the immediate result is a deformation of the roof frame. Therefore, great demands are placed on the attachment of the roof module to the vehicle roof.
- 20 The present invention provides a vehicle roof in which the connection between roof module and roof frame is further improved. In the case of a vehicle roof of the type cited above, this is achieved in that on the lower side of the roof module a

rigid safety element is provided, which has at least one protruding portion that points to the adjoining edge and that is positioned lower than the edge. The rigid safety element not only provides for a form-locking latching means in case of a deformation of the roof frame. Rather, it also reinforces the roof module itself. If the roof frame, with its edge pointing inward, i.e., toward the safety element, is horizontally displaced as caused by a deformation, then the edge moves over the protruding portion of the roof module, so that the safety element engages behind the edge. Therefore, the roof module is prevented from lifting off from the roof frame even in the event that the attachment of roof frame to roof module may have been partially destroyed. In the case of a non-deformed roof frame, the protruding portion lies lateral to the edge and therefore does not yet grasp the edge from behind. This enables the roof module to be placed onto the roof frame from above. The safety element, however, is situated almost directly bordering the edge, so that in the event of even a small deformation of the roof frame, the edge is "caught" by the safety element.

The edge is preferably a flange-like, inward-pointing extension of the roof frame. The roof frame is a hollow section, protruding to the inside from which is a horizontal, preferably continuously surrounding, thin sheet metal flange that serves to attach, center and support the roof module. This sheet metal flange according to the preferred embodiment is the edge of the roof frame, under which the safety element engages in case of a deformation of the roof frame.

The roof module is preferably fastened to this edge, in particular by gluing and screw connections, an appropriate adhesive bead continuously running around the edge in accordance with the preferred embodiment.

The safety element is, for example, a sheet metal part.

According to the preferred embodiment, the safety element is embedded in a foam backing provided under the exterior skin of the roof module. This embedding can be realized such that the safety element is even entirely embedded in the foam backing, which assures a good anchorage of the safety element in the

foam backing. However, the foam backing does not exert great resistance to the horizontally displaceable edge in the event of the deformation of the roof frame, so that the edge penetrates into the foam and can move over the protruding portion of the safety element, which is situated lower.

5 In the preferred embodiment, the safety element is a hollow section that is open towards the edge of the roof frame, the hollow section receiving the edge within it upon a horizontal displacement of the edge towards the safety element. In the event of a deformed roof frame, the hollow section provides for a form-locking connection in the vertical direction upwards and downwards. In addition,
10 the hollow section provides for a large-area transmission of force into the foam and prevents the foam from being split by the edge penetrating into it. The safety element is preferably a C-profile, or it can be, e.g., a double-T profile.

If the safety element runs around the lower side of the roof module, it can also serve as a reinforcement frame and can have a dual function.

15 Further features and advantages of the present invention will be apparent from the following description and the following drawings, to which reference is made and in which:

Figure 1 is a top view of a vehicle roof according to the invention,

Figure 2 shows a section along line II-II of the vehicle roof in the area of the
20 connection between roof frame and roof module,

Figure 3 is a sectional view of the area depicted in Figure 2 with a roof frame that has been deformed by a pole impact test.

In Figure 1, a vehicle roof is depicted which has a continuously surrounding roof frame 10. From above a roof module 12 is placed onto roof frame 10 and is
25 permanently and fixedly attached to the roof frame, i.e., roof module 12 cannot be displaced with respect to roof frame 10. Roof module 12 can have a roof portion 16 that can be closed by a movable cover 14, so that roof module 12 can contain an integrated sliding-roof system.

In Figure 2, it can be seen that the roof frame, which is made of sheet metal, has a hollow section that is closed as seen in cross-section, from which an inward-pointing extension protrudes in the form of a plate-shaped, horizontal, flange-like edge 20. Roof module 12 is placed from above onto this horizontal edge that preferably runs continuously around the entire roof frame.

Roof module 12 has an exterior skin 22, preferably a deep-drawn plastic film, having a foam backing 24 on its lower side, the foam backing preferably being made of PU material. Reference numeral 26 indicates a seal on the exterior edge of roof module 12, the seal being designed to assure a tightly sealed connection to roof frame 10. The foam backing 24 in the area of edge 20 has a groove-like recess 30, in which an adhesive bead 32 is provided, which continuously surrounds the entire edge 20 and by means of which the roof module 12 is secured to the edge 20. In addition, screw connections 60 can also be provided.

As depicted in Figure 2, roof module 12 does not engage behind roof frame 10 at any location, so that it can simply be placed onto edge 20 from above.

Directly bordering edge 20, foam backing 24 has a bead 40 that protrudes downwards, which is lower than edge 20. In the area of bead 40, a C-shaped hollow section that is open to edge 20, or, e.g. a double-T profile 70, is completely embedded in foam backing 24. The hollow section constitutes a safety element 50 that, in the event of a collision, acts to join the roof frame to the roof module. The lower leg 52 of safety element 50, i.e. one portion of safety element 50, is lower than edge 20, the upper leg 54 being higher than edge 20. As can be seen in Figure 2, safety element 50 all but directly borders edge 20.

Safety element 50 forms a surrounding reinforcement profile of roof module 12.

According to an alternative embodiment, safety element 50 can be fastened only along the side beams of roof frame 10, i.e., extending only in the vehicle longitudinal direction, it being possible in this context to optionally provide

additional connecting braces between the two-sided, rail-shaped safety elements 50.

The mode of functioning of safety element 50 is apparent in Figure 3. In case of a side impact, which is simulated by a so-called pole impact test, a horizontal, lateral force F is exerted on roof frame 10. Roof frame 10 is deformed laterally and horizontally, and its edge 20 is displaced horizontally and laterally. Edge 20 penetrates into foam backing 24 and is received between legs 52, 54 in safety element 50, it being possible for the edge, as a function of the intensity of force F , to abut against connecting bar 56 of legs 52, 54. Even if an upwards-directed force K should be exerted on adhesive bead 32, which would bring adhesive bead 32 to the limits of its load bearing capability, roof module 12 would not be separated from edge 20, because safety element 50 additionally secures roof module 12 upwards and downwards. In addition, a counterforce F_G to force F is exerted by safety element 50 of roof module 12, the counterforce increasing the stability of the roof in all.

List of reference numerals

	10	roof frame
	12	roof module
5	14	cover
	16	roof portion
	20	edge
	22	exterior skin
	24	foam backing
10	26	seal
	30	recess
	32	adhesive bead
	40	bead
	50	safety element
15	52	lower leg
	54	upper leg
	56	connecting bar
	60	screw connection
	70	double-T profile
20		

Claims

1. A vehicle roof, having a roof frame (10) and
a roof module (12), which is permanently and fixedly attached to the roof
frame (10),
5 the roof frame (10) having an edge (20) that points inwardly toward the roof
module (12),
characterized in that
on the lower side of the roof module (12) a rigid safety element (50) is
provided, which has at least one protruding portion that points to the adjoining
10 edge (20) and that is positioned lower than the edge (20).
2. The vehicle roof as recited in claim 1, characterized in that the safety
element (50) does not engage behind the edge (20).
3. The vehicle roof as recited in claim 1 or 2, characterized in that the edge
(20) is a flange-like, inward-pointing extension of the roof frame (10).
- 15 4. The vehicle roof as recited in claim 3, characterized in that the flange-like
extension is a plate-shaped sheet metal portion.
5. The vehicle roof as recited in any of the preceding claims, characterized
in that the roof module (12) is attached to the edge (20).
6. The vehicle roof as recited in claim 5, characterized in that the roof
20 module (12) is attached to the edge (20) by means of gluing.
7. The vehicle roof as recited in claim 6, characterized in that the roof
module (12) is surroundingly attached to the edge (20) by means of gluing.

8. The vehicle roof as recited in any of the preceding claims, characterized in that the roof module is additionally secured to the edge (20) by at least one screw connection (60).

5 9. The vehicle roof as recited in any of the preceding claims, characterized in that the safety element (50) is a sheet metal part.

10. The vehicle roof as recited in any of the preceding claims, characterized in that the safety element (50) is embedded in a foam backing (24) provided under an exterior skin (22) of the roof module (12).

10 11. The vehicle roof as recited in claim 10, characterized in that the safety element (50) is completely embedded in the foam backing (24).

12. The vehicle roof as recited in any of the preceding claims, characterized in that the safety element (50) is a hollow section that is open towards the edge (20), the hollow section receiving the edge (20) within it upon a horizontal displacement of the edge (20) towards the safety element (50).

15 13. The vehicle roof as recited in any of the preceding claims, characterized in that the safety element (50) is a C-profile.

14. The vehicle roof as recited in any of the claims 1 to 12, characterized in that the safety element is a double-T profile.

20 15. The vehicle roof as recited in any of the preceding claims, characterized in that the safety element (50) is a surrounding reinforcement frame of the roof module (12).

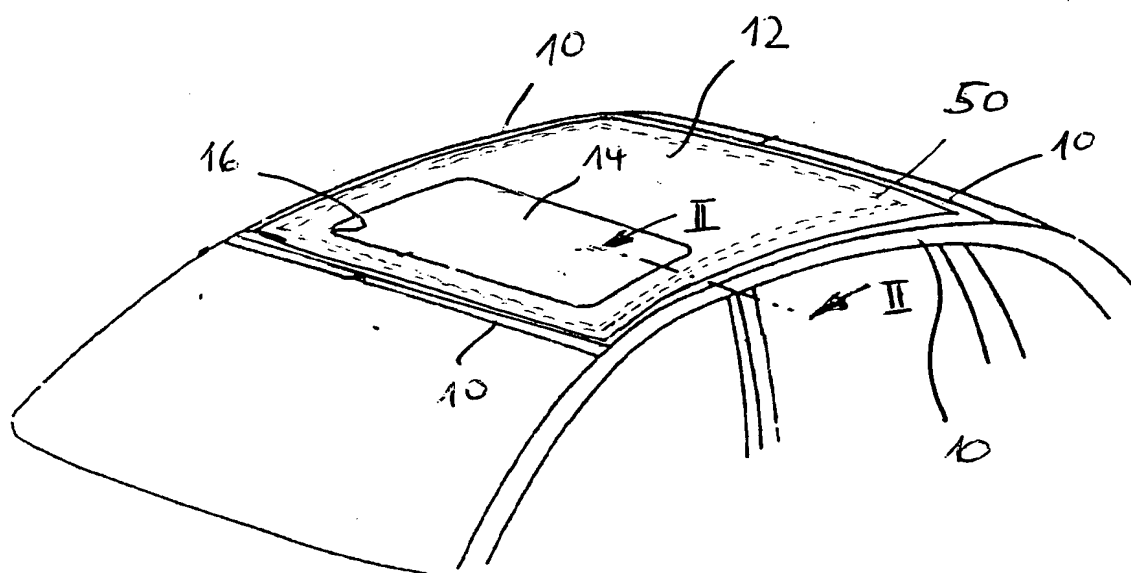
16. The vehicle roof as recited in claim 15, characterized in that the reinforcement frame is continuous in annular fashion.

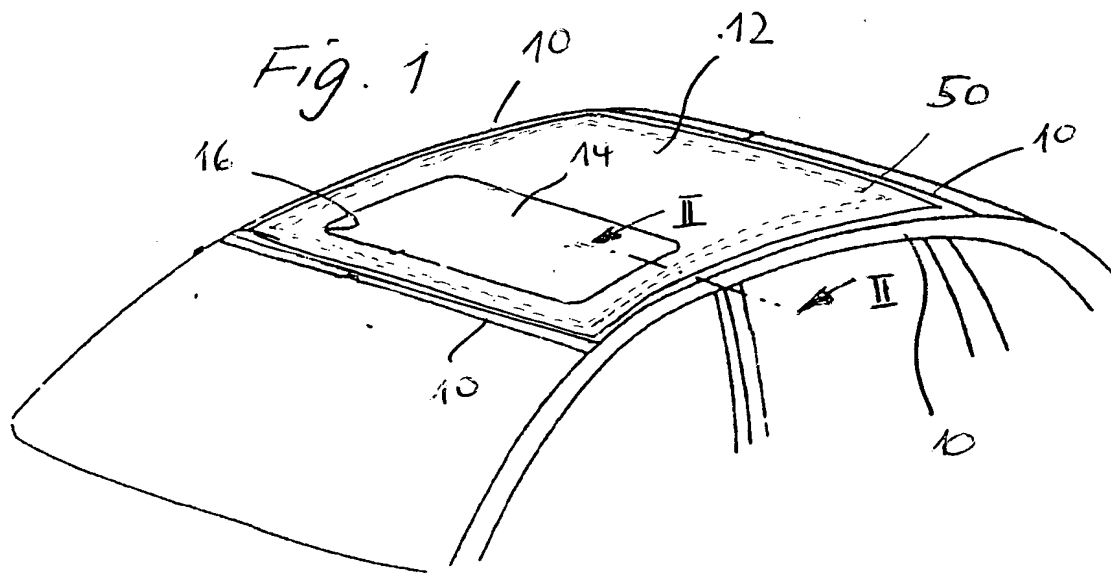
Abstract

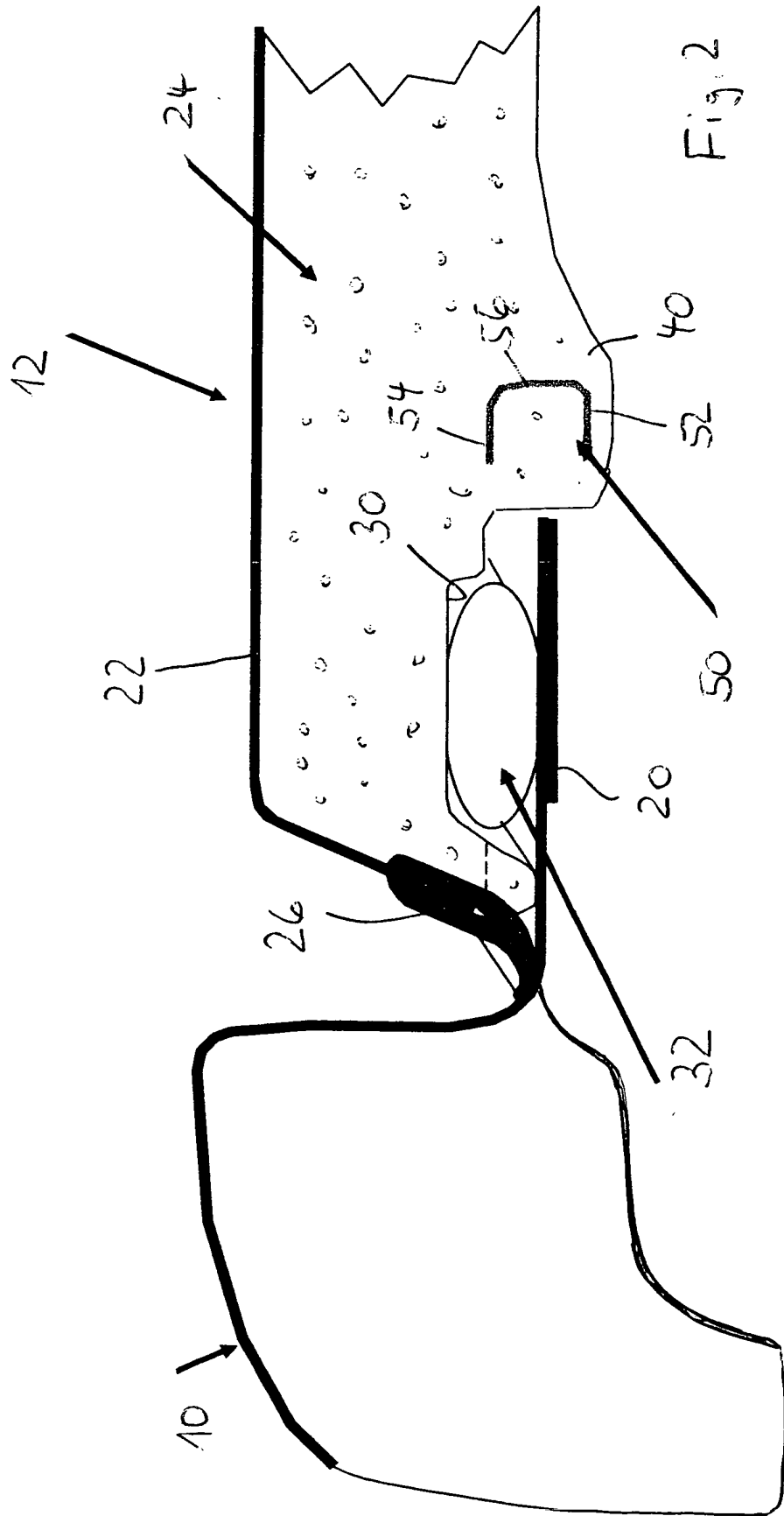
Vehicle Roof

5 A vehicle roof having a roof frame (10) and a roof module (12) which is permanently and fixedly attached to the roof frame (10), has a rigid safety element (50) on the lower side of the roof module (12), which upon a horizontal, plastic deformation of the roof frame (10) engages behind the roof frame and holds the roof module (12) on the roof frame (10).

10 Figure 1







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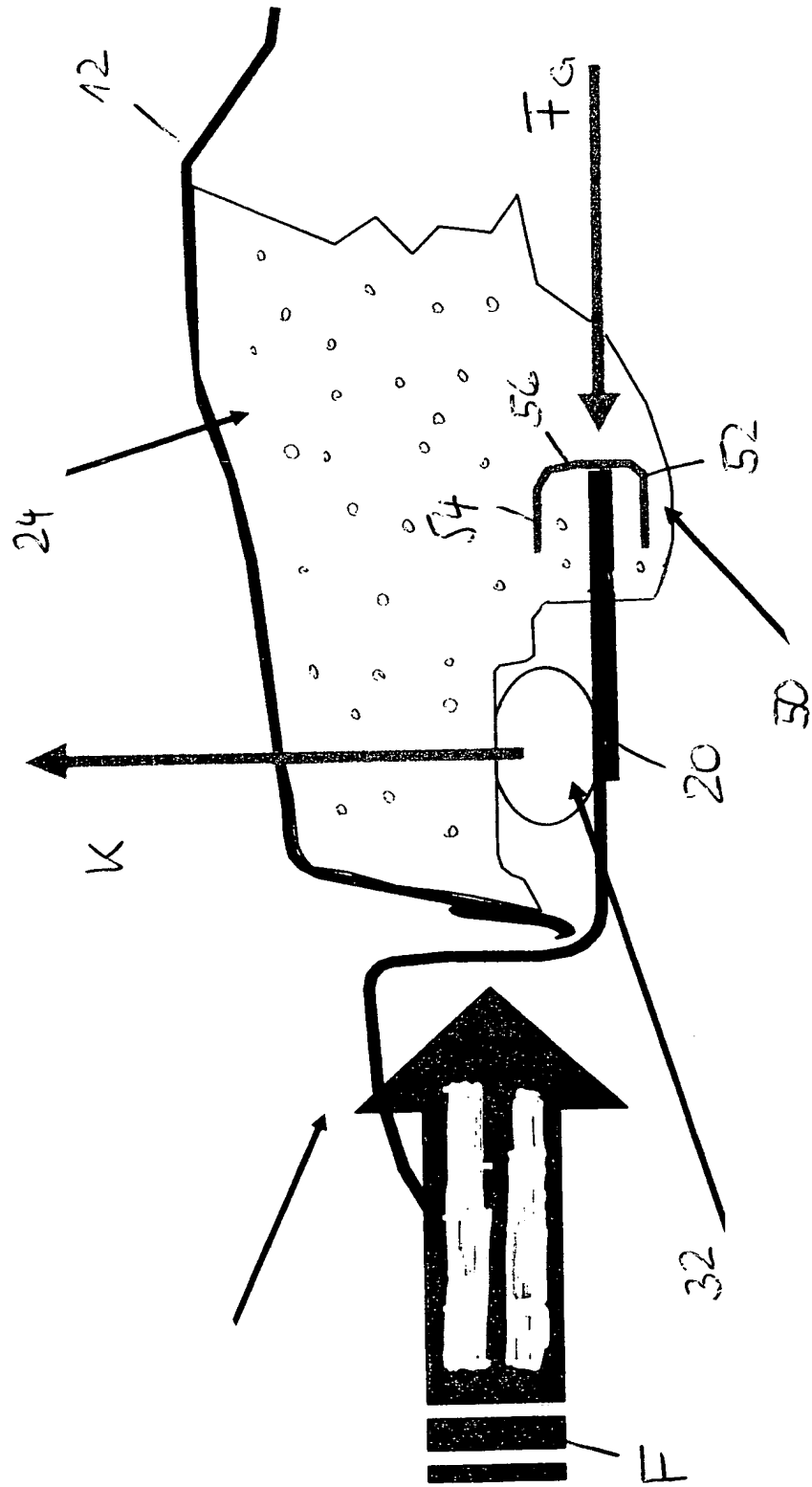


Fig. 3